



## ***Parapercis nigrodorsalis* (Perciformes: Pinguipedidae), a new species of sand-perch from northern New Zealand and the Norfolk Ridge, Tasman Sea and remarks on *P. binivirgata* (Waite, 1904)**

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### **Abstract**

A new species of pinguipedid fish, *Parapercis nigrodorsalis*, is described from 17 specimens collected off the North Island of New Zealand and Wanganella Bank, Norfolk Ridge, Tasman Sea, in depths of 56–280 m. The species has also been photographed underwater off the Poor Knights Islands Reserve and Burgess Island, Mokohinau Group, in New Zealand. It is most similar to *Parapercis binivirgata* (Waite, 1904) in morphology, coloration and meristic values, but is unique among the genus in having a combination of dorsal-fin rays V, 23, anal-fin rays I, 19, lateral-line scales 57–63, vomer with 1–2 irregular rows of robust conical teeth, palatines with 1–2 rows of small teeth, angle of subopercle smooth, 10 abdominal and 22 caudal vertebrae, and coloration, including seven broad reddish-brown bands on the upper body between the spinous dorsal-fin and the caudal peduncle, most bands bifurcated into close-set double bars with black smudge-like blotches below, and membrane of the spinous dorsal fin black. Comparison of the mitochondrial cytochrome c oxidase subunit 1 (CO 1) genetic marker utilised in DNA barcoding produced a genetic divergence of 5.38% and 7.63% between the new species and its two closest sampled congeners. The holotype of *P. binivirgata* is identified from two specimens previously regarded as syntypes, some revisions are made to meristic data in the original description of the latter, and a detailed description of the revised geographic range of *P. binivirgata* is provided.

**Key words:** Pinguipedidae, *Parapercis*, new species, *Parapercis nigrodorsalis*, *Parapercis binivirgata*, DNA barcoding, New Zealand, New Caledonia, Norfolk Ridge, Australia

### **Introduction**

Many species of *Parapercis* Bleeker, 1863 are distinguished by relatively minor variations in meristic formulae and subtle differences in coloration. Several species (e.g. *Parapercis allporti* (Günther, 1876), *Parapercis binivirgata* (Waite, 1904), *Parapercis decemfasciata* (Franz, 1910) and *Parapercis multifasciata* Döderlein in Steindachner & Döderlein, 1884) have a pattern of seven or more dark transverse bars across the upper body. In 2003, a consortium of Australian, New Zealand and French scientific organisations collaborated to investigate the biodiversity of benthic communities on the Norfolk Ridge and Lord Howe Rise of the Tasman Sea on the NORFANZ cruise. During the cruise, seven small specimens of *Parapercis* with numerous dark transverse bars were collected on Wanganella Bank, at a depth of 121–126 m. The species was very similar to *P. binivirgata* in meristic values and coloration, but it had a distinctly black spinous dorsal fin and fewer transverse bars, the first of which was situated below the posterior portion of the spinous dorsal fin, instead of on the nape. Initially it was surmised that the colour differences between the NORFANZ specimens and larger available specimens of *P. binivirgata* from Australia may be due to the immature status of the former, so additional specimens of various size classes were sourced from across the known range of *P. binivirgata* for direct comparison. It was then discovered that the two forms occurred sympatrically in New Zealand waters, but not in Australia. The coloration of several large male specimens from

New Zealand, located in the Museum of New Zealand Te Papa Tongarewa, was consistent with the smaller females collected from Wanganella Bank, and on closer inspection these specimens differed with *P. binivirgata* in counts of pectoral-fin rays, gill rakers and lateral-line scales.

Waite (1904) explicitly stated in his original description of *P. binivirgata* that it was made from a single specimen, although he mentioned that another smaller specimen (in the Australian Museum) was known to him. Despite this, there has been some confusion regarding the type status of his material, with several authors referring to the existence of syntypes (Hoese, *et al.* 2006: 1490; Eschmeyer, 2014). We herein provide evidence to confirm the status of a unique holotype, and make some revisions to meristic data presented in the original description. An expanded geographic range for *P. binivirgata* is also presented, following examination of material found after a review of the literature, and an extensive review of museum holdings.

DNA barcoding using the mitochondrial cytochrome c oxidase subunit 1 (CO1) genetic marker is now routinely used in conjunction with morphological techniques to distinguish similar or cryptic species complexes. In this study, *P. nigrodorsalis* is described as a new species based on morphological features, which are strongly supported by molecular evidence. With the addition of this new species, *Parapercis* now includes 78 recognised species (Ho *et al.*, 2012; Sparks & Baldwin, 2012; Ho & Johnson, 2013; Chen *et al.*, 2013).

## Methods and materials

Institutional codes for types and comparative material follow Fricke & Eschmeyer (2013).

**Morphological analysis.** Lengths of specimens are given as standard length (SL), being the distance from the front of the upper lip to the base of the caudal fin (posterior end of the hypural plate). The abbreviation HL is used for head length. Lateral-line scale counts are to the base of the caudal fin, and do not include several additional pored scales on the fin. Gill-raker counts include all rudiments. Vertebral counts were made from radiographs. Measurements were taken with digital calipers, to the nearest 0.1 mm, with the aid of a stereo microscope where necessary. Methods for counts and measurements otherwise follow Randall (2003). Where different, values for paratypes follow those of the holotype in parentheses. Meristic and morphometric details for the new species are presented in Tables 1–2.

**Molecular analysis.** Tissues from six specimens of *Parapercis*, including four *P. binivirgata* and one *P. allporti* from CSIRO Marine and Atmospheric Research (CSIRO), and one *P. nigrodorsalis* sp. nov. from the Museum of New Zealand Te Papa Tongarewa (NMNZ), were sequenced for the DNA barcoding CO1 marker fragment, following the methods outlined in Ward *et al.* (2008). Existing CO1 sequences for three other *Parapercis* species and several other species of the Pinguipedidae were obtained from GenBank or BOLD (Barcode of Life Database), to use as outgroups in the phylogenetic analysis. The new *Parapercis* sequences and several other unpublished sequences were deposited in GenBank (accession numbers in Table 4). The CO1 sequence of the currently undescribed *Parapercis* sp. 4 (of Johnson) was kindly provided by CSIRO Marine and Atmospheric Research. Chromatographs were checked and all sequences were aligned using Genieious v 7.1.2 (created by Biomatters, available <http://www.geneious.com>). Average pairwise sequence divergence (uncorrected p) was calculated among and between species using PAUP\* v4.b.10 (Swofford, 2002). Bayesian phylogenetic analyses were carried out in MrBayes v3.2.1 (Ronquist *et al.*, 2012) and posterior probabilities were calculated using a Markov chain, Monte Carlo (MCMC) sampling approach. Models of sequence evolution/substitution patterns were calculated independently and determined by the Aikake and Bayesian information criteria (AIC and BIC) in jModeltest v2.1.3 (Guindon & Gascuel, 2003; Posada, 2008). By default MrBayes v3.1.2 performs two independent runs. We ran the analysis twice, so that four independent runs were performed. For each run, starting trees were random and four simultaneous Markov chains were run for 2,000,000 generations with trees sampled every 1,000 generations, resulting in a total of 8,000 saved trees over the four runs. Burn-in values for each run were set at 500,000 generations (500 trees) after empirical values of stabilizing likelihoods indicated that convergence of the MCMC chains had been reached. A combined majority rule consensus tree from the four independent runs was generated in PAUP\* v4.b.10 (Swofford, 2002) by sequentially importing the four MrBayes tree files (.t files); excluding the first 500 trees of each tree file and retaining the previous 1,500 trees in memory. The resulting consensus tree was therefore constructed from 6,000 trees. The posterior probabilities on the consensus tree are indicated only where branch support is greater than 0.5 (Posada & Crandall, 1998).

**TABLE 1.** Selected meristic and morphological values for specimens examined of *Parapercis nigrodorsalis* sp. nov. and *P. binivirgata* (measurements as percentage of standard length). Values in brackets are number of specimens.

	<i>P. nigrodorsalis</i>		<i>P. binivirgata</i>		
	Holotype NMNZ P.052461	Paratypes (n = 17)	Holotype AMS I. 5256	Non-types Australia (n = 29)	Non-types NZ/Norfolk/Lord HR (n = 26)
Standard length (mm)	113.5	52.6–156.0	147.1	63.1–147.1	87.4–184.2
Dorsal-fin rays	V, 23	V, 23	V, 23	V, 23–24	V, 23
Anal-fin rays	I, 19	I, 19	I, 19	I, 19 (21)–I, 20 (8)	I, 19 (18)–I, 20 (1)
Pectoral-fin rays	19, 19	19–21	21, 21	19–21	19–20
Gill rakers	5+9=14	5–6+8–10=13– 15	6+9=15	4–7+8–9=12–15	5–7+7–10=12–16
Lateral-line scales	61	57–63	65	60–67	59–66
Lower jaw teeth (outer row)	3 + 3	3 + 3	3 + 3	3 + 3	3 + 3
Vertebrae (abdominal + caudal)	10 + 22	10 + 22 (4)	10 + 22	10 + 22 (4)	10 + 22 (1)
Body depth	16.1	16.0–17.8	17.4	15.5–18.1	17.0–19.4
Body width	18.2	17.7–18.8	19.0	19.0–21.1	17.8–21.0
Head length	25.5	25.1–26.3	24.6	24.6–26.8	25.2–26.9
Snout length	6.6	5.0–6.8	5.2	5.2–6.9	5.8–7.5
Orbit diameter	7.5	7.4–9.5	7.7	7.7–9.2	8.1–10.3
Interorbital width	3.1	2.7–3.8	2.6	2.3–3.2	1.7–3.3
Preorbital depth	3.3	3.0–4.4	3.7	3.2–3.8	2.7–4.2
Upper jaw length	12.9	12.4–13.2	13.5	11.4–13.5	10.4–13.1
Predorsal length	27.5	26.7–30.3	28.1	28.1–29.4	26.5–29.8
Preanal length	45.6	45.3–47.9	44.2	44.2–49.0	43.8–47.8
Prepelvic length	24.9	24.6–27.6	24.2	23.2–26.1	24.6–27.8
Caudal-peduncle depth	10.2	9.0–9.6	10.1	9.1–10.1	8.9–10.3
Caudal-peduncle length	8.4	8.2–9.5	7.7	7.0–9.0	7.3–8.3
Dorsal-fin base	64.2	62.3–65.4	65.3	61.7–66.0	58.9–65.5
First dorsal-fin spine length	2.6	1.9–3.1	4.1	1.6–4.1	1.7–4.3
Second dorsal-fin spine length	3.7	3.8–4.7	4.3	2.6–4.9	3.4–5.9
Third dorsal-fin spine length	5.0	4.7–6.1	6.1	4.3–6.6	4.6–6.3
Fourth dorsal-fin spine length	5.7	5.6–6.3	6.5	5.1–7.4	4.8–6.7
Fifth dorsal-fin spine length	5.8	5.8–6.7	6.4	5.2–7.7	5.6–7.5
Longest dorsal-fin ray	13.9	14.1–15.4	15.7	13.5–16.6	13.1–17.0
Anal-fin base	47.3	44.2–47.6	48.1	43.7–48.1	41.2–48.0
Anal-fin spine length	5.2	4.0–6.0	4.8	3.9–5.6	2.6–5.9
Longest anal-fin ray	13.1	12.4–14.9	13.7	12.9–14.4	12.9–16.8
Caudal-fin length	19.1	18.2–21.7	19.5	17.2–21.1	19.0–21.4
Pectoral-fin length	19.6	20.1–24.0	23.2	22.7–24.4	22.5–25.1
Pelvic-fin length	21.6	20.3–25.6	24.6	21.7–24.6	19.5–24.6

**TABLE 2.** Frequency of pectoral-fin rays, lateral-line scales and gill rakers in material examined of *Parapercis nigrodorsalis* sp. nov. and *P. binivirgata* (\* denotes holotype).

Pectoral Fin Rays (left/right side)														
	19/19		19/20 20/19		20/20		21/20		21/21					
<i>P. nigrodorsalis</i>	10*		3		8		-		1					
<i>P. binivirgata</i> (Australia)	3		3		21		2		1*					
<i>P. binivirgata</i> (New Zealand)	1		-		6		-		-					
<i>P. binivirgata</i> (Norfolk Ridge/Lord Howe Rise)	3		2		9		-		-					
Lateral-line scales														
	57	58	59	60	61	62	63	64	65	66	67			
<i>P. nigrodorsalis</i>	3	1	3	5	5*	2	2	-	-	-	-			
<i>P. binivirgata</i> (Australia)	-	-	-	1	2	1	4	5	7*	7	2			
<i>P. binivirgata</i> (New Zealand)	-	-	-	-	1	-	1	2	2	1	-			
<i>P. binivirgata</i> (Norfolk Ridge/Lord Howe Rise)	-	-	1	4	1	1	9	2	-	1	-			
Gill Rakers														
	Upper				Lower				Total					
	4	5	6	7	7	8	9	10	11	12	13	14	15	16
<i>P. nigrodorsalis</i>	-	16*	5	-	-	2	14*	5	-	-	1	11*	9	-
<i>P. binivirgata</i> (Australia)	5	16	7*	1	-	20	9*	-	-	5	11	8	5*	-
<i>P. binivirgata</i> (New Zealand)	-	5	1	1	-	4	3	-	-	-	4	1	1	1
<i>P. binivirgata</i> (Norfolk Ridge/Lord Howe Rise)	-	11	2	-	1	10	1	1	-	1	8	3	1	-

***Parapercis nigrodorsalis* sp. nov.**

**New English name: Blackfin Sandperch**

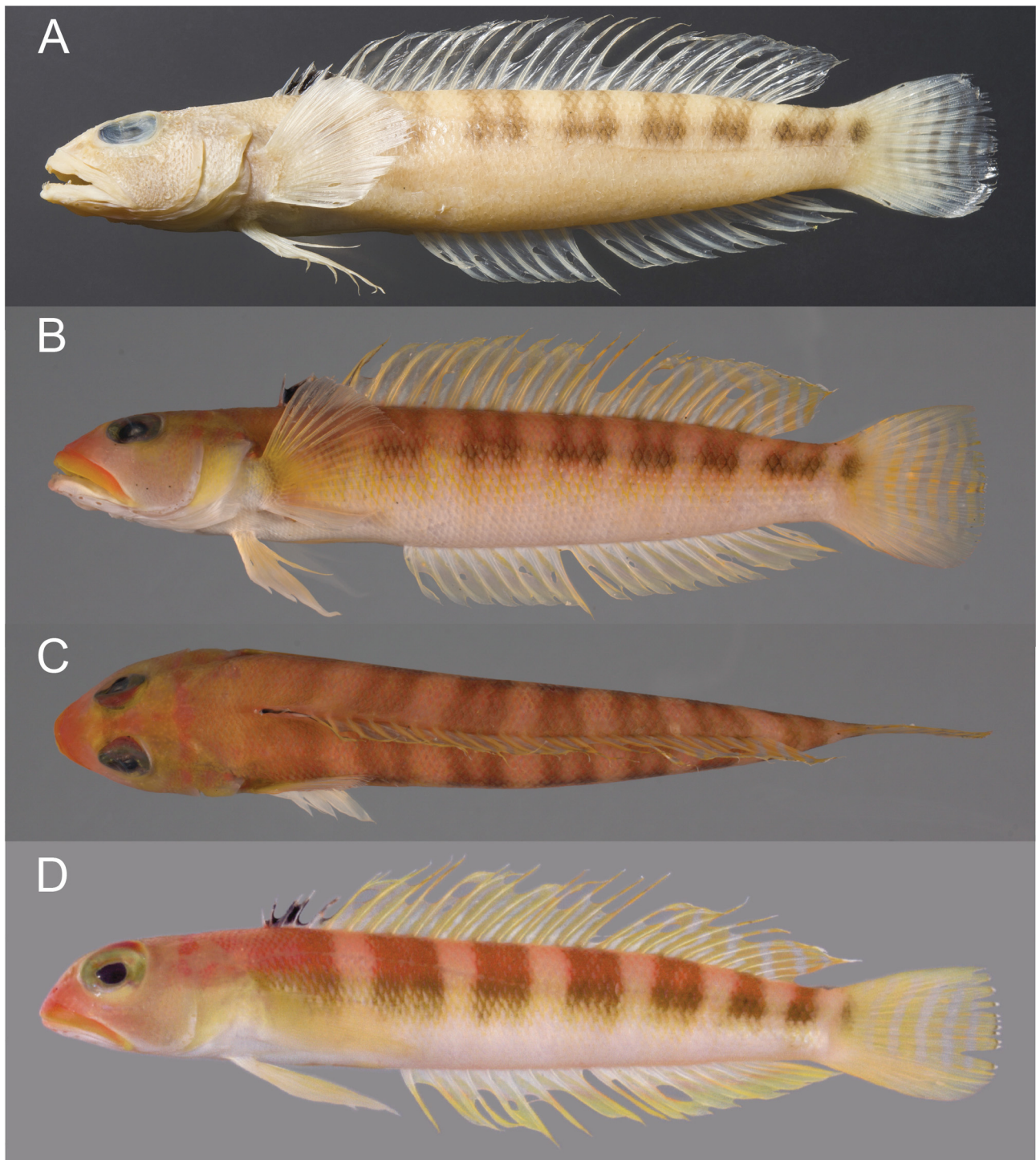
Figures 1–2, 5–6; Tables 1–3

*Parapercis binivirgata* (not of Waite, 1904): Moreland, 1975: 288 (in part).

*Parapercis* NFZ1: Clark & Roberts, 2008: Appendix 4, unnumbered.

**Holotype.** NMNZ P.052461, 113.5 mm, Ranfurly Bank, New Zealand, 37°32.782'S 178°53.415'E, 68–70 m, beam trawl, RV *Tangaroa*, 30 May 2011.

**Paratypes.** (n = 17) AMS I.42754-002, 76.9 mm, Wanganella Bank, west Norfolk Ridge, Tasman Sea, 32°36.9417'S 167°35.4167'E, 121–126 m, trawl, NORFANZ survey, 29 May 2003; CSIRO H.6061-01, 3: 56.5–68.9 mm, same data as above; NMNZ P.039278, 81.2 mm, same data as above; NMNZ P.039283, 2: 78.8–81.8 mm, same data as above; NMV A.25154, 76.3 mm, same data as above; NMNZ P.002207, 156.0 mm, Off Mayor Island, Bay of Plenty, New Zealand, 37°20'S 176°18'E, 146 m, trawl, Jul 1957; NMNZ P.036802, 128.6 mm, reef SE of White Island, Bay of Plenty, New Zealand, 37°31'S 177°12'E, 160 m, handline, Aug 1999; NMNZ P.041834, 81.6 mm, SE of Colville Ridge, New Zealand, 37°28.25'S 177°13.065'E, 200–175 m, epibenthic sled, 12 Nov 2004; NMNZ P.052460, 99.1 mm, Ranfurly Bank, New Zealand, 37°32.782'S 178°53.415'E, 68–70 m, beam trawl, 30 May 2011; NMNZ P.052476, 112.7 mm, Ranfurly Bank, New Zealand, 37°38.783'S 178°56.793'E, 158–160 m, beam trawl, 1 Jun 2011 (genetic sample listed in Table 4); NMNZ P.052477, 81.6 mm, Off East Cape, New Zealand, 37°31.178'S 178°51.833'E, 110–113 m, beam trawl, 1 Jun 2011; NMNZ P.052478, 2: 52.6–67.4 mm, same data as previous; NMNZ P.052492, 75.7 mm, Off East Cape, New Zealand, 37°35.682'S 178°51.907'E, 56–58 m, beam trawl, 1 Jun 2011.



**FIGURE 1.** Type specimens of *Parapercis nigrodorsalis* sp. nov. A. Holotype, NMNZ P.052461, 113.5 mm SL, male, lateral view (preserved) (Photo: P. Waddington); B. Holotype, lateral view (fresh); C. Holotype, dorsal view (fresh); D. Paratype, NMNZ P.039278, 81.2 mm SL, female (fresh) (Photo: NORFANZ Founding parties).

**Non-types.** (n = 5) NMNZ P.041807, 45.9 mm SL, SE of Colville Ridge, New Zealand, 37°21.305'S 177°06.09'E, 260–280 m, epibenthic sled, 14 Nov 2004; NMNZ P.052456, 58.1 mm, Off East Cape, New Zealand, 37°28.185'S 178°51.78'E, 106–177 m, epibenthic sled, 1 Jun 2011; NMNZ P.052459, 89.5 mm, North Taranaki Bight, NW of Kawhia Harbour, New Zealand, 37°58.302'S 174°04.857'E, 115–118 m, beam trawl, 2 Apr 2011; NMNZ P.052471, 47.8 mm, NW of Three Kings Islands, New Zealand, 33°57.578'S 171°46.343'E, 92–96 m, epibenthic sled, 28 Mar 2011; NMNZ P. 052484, 62.0 mm, same data as previous.



**FIGURE 2.** Underwater photograph of *Parapercis nigrodorsalis* sp. nov., taken at Ngaroimata Point, Poor Knights Islands Marine Reserve, New Zealand at a depth of about 65 m. (Photo: Richard Robinson, [www.depth.co.nz](http://www.depth.co.nz)).

**Diagnosis.** A species of *Parapercis* with dorsal-fin rays V, 23; anal-fin rays I, 19; pectoral-fin rays 19–21 (modally 19); lateral-line scales 57–63 (modally 60); gill rakers 5–6 + 8–10 = 13–15 (modally 14); predorsal scales 9–11, cycloid; scales on cheek ctenoid (except few anteriorly on preorbital), in about 18 horizontal rows; 6 canine teeth in outer row at front of lower jaw; vomer with 2 rows of robust conical teeth in adults; palatines with 1–2 rows of small teeth; angle of subopercle smooth, lacking spinules; 10 abdominal and 22 caudal vertebrae; pelvic fins reaching between vent and base of second anal-fin ray; and coloration including seven broad reddish-brown vertical bands on upper body between spinous dorsal fin and caudal peduncle, each band except first and last partially bifurcated into two close-set double bars, each bar with a black smudge-like spot at its lower end, membrane of spinous dorsal-fin black.

**Description.** Dorsal-fin rays V, 23; anal-fin rays I, 19; all dorsal- and anal-fin rays branched, last to base; pectoral-fin rays 19 (19–21, modally 19, occasionally asymmetrically 19 on one side and 20 on the other), upper ray unbranched, others including lowermost branched; pelvic-fin rays I, 5; branched caudal-fin rays 15; lateral-line scales 61 (57–63), plus usually 2 smaller pored scales on caudal-fin base; scales above lateral line to origin of dorsal fin 8 (7–8), to base of anterior soft rays of dorsal fin  $5\frac{1}{2}$ ; scales below lateral line in a oblique row to origin of anal fin 14 (14–15); circumpeduncular scales 24 (24–25); predorsal scales 10 (9–11), extending to (or almost to) a vertical from upper corner of preoperculum; horizontal row of scales from preorbital across cheek to edge of preopercle about 20, vertical rows below middle of eye 7; gill rakers on first arch 5 + 9 = 14 (5–6 + 8–10 = 13–15); branchiostegal rays 6; vertebrae 10 + 22 = 32.

Body depth 6.2 (5.6–6.25) in SL; body subcylindrical, greatest width 0.9 (0.9–1.0) in body depth; head length 3.95 (3.8–4.0) in SL; snout pointed, its length 3.85 (3.9–5.15) in HL; orbital diameter 3.35 (2.75–3.35) in HL; eyes directed more laterally than dorsally, bony interorbital space narrow, 8.25 (6.65–9.65) in HL; caudal-peduncle depth 2.5 (2.65–2.85) in HL; caudal-peduncle length 3.0 (2.75–3.1) in HL.

Mouth oblique, jaws terminal, or upper lip slightly protruding beyond tip of lower jaw; curved canine teeth at front of lower jaw slightly projecting, but not visible when mouth fully closed; upper jaw extending to vertical from middle of eye (middle of eye to just posterior to rear margin of pupil), but fleshy flap extending posteriorly from the tip of the maxilla to vertical between posterior margin of pupil and posterior margin of orbit, upper-jaw length 2.0 (2.0–2.05) in HL; upper jaw with 20–21 (19–22) outer curved canines on each side, first 6–8 clearly the largest, of these the second or third the largest, those following gradually reducing in size posteriorly, broad inner band of small villiform teeth anteriorly, narrowing gradually to form only two rows at rear of jaw; front of lower jaw on each side with 3 enlarged curved canines in distinctly separate outer row, tooth third from symphysis largest, followed in outer row by 4–5 (4–6) small canine teeth, then 3 abruptly larger strongly curved canines of

which the middle is distinctly largest, broad inner band of villiform teeth extending posteriorly from symphysis to side of jaw just posterior to largest tooth in outer row, remaining teeth subequal, moderate, in single row of 16 (12–16). Vomer with 2 (1–2, single row only in juveniles) irregular crescentic rows of 6 (4–9) robust conical teeth anteriorly, medial teeth largest, second posterior row shorter, comprised of 7 (0–7) slightly smaller teeth; palatines with 2 (1–2) rows of small subequal teeth, 8 (6–8) in outer row and 3 (0–3) medially in inner row. Tongue spatulate with broadly rounded tip, dorsal surface covered in numerous minute papillae.

Gill membranes united with broad free fold, not attached to isthmus. Gill rakers short, the longest about 3.5 in length of longest gill filament on first gill arch. Anterior nostril small, situated anterior to mid-eye, about half distance from anterior margin of eye to snout tip, with a membranous tube, often lying flat against snout in preserved specimens. Posterior nostril slightly more than half distance from anterior margin of eye to anterior nostril, dorsoposterior to, and about same width as anterior nostril, its opening oval-shaped, with a rounded membranous flap on anteroventral edge, the flap covering most of the nasal opening when depressed; internarial distance about twice width of posterior nostril.

Opercle with distinctly exposed, flattened, blade-like spine; subopercle, including angle, entire; preopercle entire, the margins naked and broadly rounded.

Lateral line continuous, ascending smoothly from opercle to below second or third soft dorsal-fin ray, then approximately following contour of back; scales ctenoid, except for those on nape, on breast and midline of belly, and several anteriormost scales on subopercle; scales on middle of sides with up to about 46 cteni; scales on cheek extending forward to a vertical from anterior margin of orbit in adults to below anterior margin of pupil in juveniles; no scales on dorsal, anal or pelvic fins; up to 10 rows of small feebly ctenoid followed by cycloid scales on base of pectoral-fin rays; elongate ctenoid scales densely arranged on proximal two-thirds of caudal fin in up to 28 rows.

Origin of dorsal fin just posterior (above or just posterior) to vertical from axil of pectoral fin, the predorsal length 3.65 (3.3–3.75) in SL; dorsal-fin spines progressively longer, the first 9.95 (8.15–13.0) in HL; fifth dorsal-fin spine longest, 4.4 (3.75–4.4) in HL; membrane from fifth spine to first soft ray attached near tip of fifth dorsal-fin spine and only slightly incised; 20<sup>th</sup> (19<sup>th</sup> or 20<sup>th</sup>) soft dorsal-fin ray the longest, 1.85 (1.65–1.85) in HL; origin of anal fin below base of fifth soft dorsal-fin ray, preanal length 2.2 (2.1–2.2) in SL; anal-fin spine slender, closely attached to first soft ray, 4.9 (4.35–6.3) in HL; longest soft anal-fin ray the 17<sup>th</sup> (usually 16<sup>th</sup> or 17<sup>th</sup>), 1.95 (1.75–2.05) in HL; caudal fin slightly rounded (truncate to slightly rounded), length 5.25 (4.6–5.45) in SL; pectoral fins rounded, 11<sup>th</sup> (10<sup>th</sup> or 11<sup>th</sup>) ray longest, 5.1 (4.15–5.0) in SL, about equal to pelvic fins; origin of pelvic fins in advance of upper base of pectoral fins, on a vertical just anterior to upper corner of opercular opening (upper corner of opercular opening to tip of operculum), prepelvic length 4.0 (3.6–4.05) in SL; pelvic-fin spine closely attached to first soft ray, its termination fleshy and attenuated, reaching about three fourths distance to tip of first ray; fourth soft pelvic-fin ray longest, reaching base of anal-fin spine (to vent in largest paratype, to base of second anal-fin ray in smallest paratype), 4.65 (3.9–4.95) in SL.

*Colour when fresh.* Upper half of body in holotype (Fig. 1B–C) and paratypes (eg Fig. 1D) pale pinkish orange, with a series of seven reddish brown vertical bands. First band narrower and more diffuse than others, with darker brown blotch restricted to posteroventral portion of band. Second to seventh bands partially bifurcated, forming six pairs of close-set double bars, each with a darker brown smudge-like blotch at its lower end. First three bands extending below lateral line, fourth on or slightly below lateral line, remainder terminating on lateral line. A small dark brown spot on upper base of caudal fin, aligning horizontally with series of bands on body. A broad longitudinal diffuse yellow stripe from upper pectoral-fin base to mid-base of caudal fin, comprised of yellow edges to about four vertical rows of scales, stripe passing directly below and highlighting lower edge of series of dark brown blotches on upper body. Lower body uniformly pale creamish white. Head mostly pinkish yellow, infused with crimson-red on upper half of upper lip, snout, preorbital, interorbital and naked occipital region. Lower half of upper lip bright yellow. Operculum below opercular spine pale yellow. Lower lip and undersurface of lower jaw stark white. Spinous dorsal-fin membrane jet black. Soft dorsal fin translucent, with numerous oblique posteroventrally-directed orange-yellow bands. Basal third of anal fin white, distal two-thirds of fin pale yellow. Caudal fin semi-translucent, with six narrow wavy vertical orange-yellow bands, alternating with six similar blue-grey bands, bands becoming faint in lower quarter of fin. Pectoral fins mainly translucent, but membrane of basal third of fin faintly yellowish. Pelvic fins white, with a faint yellowish blush. Colour in life similar to fresh specimens (Fig. 2).



**FIGURE 3.** *Parapercis binivirgata* from Australian continental shelf waters. A. AMS I.5256, holotype, 147.1 mm SL, Coogee, NSW (preserved) (Photo: P. Waddington); B. AMS I.20653.007, male, 133 mm SL, East of Hat Head, NSW (fresh) (Photo: K. Graham); C. Female, 112 mm SL, Newcastle, NSW (fresh, uncatalogued) (Photo: J.E. Randall).

*Colour in alcohol.* Head and body of holotype (Fig. 1A) and paratypes pale yellowish cream, with a series of seven vertical brown bands on upper body. First band below posterior portion of spinous dorsal-fin base, faint and narrow above, terminating on midbody below lateral line in a broader dark brown smudge-like blotch. Second band much broader than first, successive bands becoming progressively narrower, each partially bifurcated, forming close-set double bars, each bar forming darker brown smudge-like blotch at its lower end. Lower edge of series of dark blotches in parallel at midbody. Belly pale cream. Tongue creamish white. Peritoneum pale. Spinous dorsal fin membrane black. Soft dorsal, anal and pectoral fins semitranslucent, lacking any distinctive markings. Caudal fin with six narrow wavy greyish bands, the latter fading in lower quarter of fin. Pelvic fins pale cream.

**Molecular results.** The phylogenetic analyses indicate that *P. nigrodorsalis* is closely related to (sister taxon), but separate from *P. binivirgata* and both species form a well-supported clade (posterior probability of 1) with the currently undescribed *P. sp. 4* (of Johnson) (Figure 6). The three other species of *Parapercis*, *P. allporti*, *P. colias* and *P. gilliesii* form the other well supported clade within our phylogeny (Figure 6). In addition to the clear phylogenetic support for the separate but close relationship of *P. nigrodorsalis* within its clade, it also has an

average uncorrected sequence divergence of 5.38% and 7.63% from *P. binivirgata* and *P. sp. 4* (of Johnson) respectively (Table 3). While lower than the overall sequence divergence among all the species of *Parapercis* in our study (13.49%), these values are higher than those found between *P. allporti* and *P. gilliesii* (3.04%); two closely related *Parapercis* species easily distinguished on morphological characters. Furthermore, the values are higher or comparable to those found among *Pinguipes brasiensis*, *Pinguipes chiliensis* and *Pseudopercis semifasciata* (3.83% – 6.29%, Table 3). Also notable is that sequence divergence within species (where more than one sequence per species available) is almost non-existent (0–0.15%, Table 3).

**Etymology.** From the Latin *nigro* for black and *dorsalis* for dorsal fin, in reference to the distinctive black spinous dorsal-fin membrane of the species.

**Distribution and abundance.** Known on rocky reef, gravel and rubble bottom on Wanganella Bank, western Norfolk Ridge, Tasman Sea, south to the North Island of New Zealand, from North Taranaki Bight, north to the Three Kings Islands and south-east to the Bay of Plenty and Colville Ridge, in depths of 56 to 280 m (Fig. 5). It is difficult to draw conclusions on the abundance of *P. nigrodorsalis* on the Norfolk Ridge from NORFANZ results, as few trawls were undertaken in the depth range that specimens were collected (over 90 percent of trawl and sled tows were in depths greater than 200 m). However, in New Zealand it appears to be relatively common where suitable habitat exists, with 14 specimens collected by trawl in depths of 56–280 m. The species has also been observed and photographed off the North Island of New Zealand by divers using rebreather apparatus in depths of 55–71 m in the Poor Knights Islands Marine Reserve, at locations known locally as Ngaroimata Point, Northern Arch, Serpent Rock and Landing Bay Pinnacle (Fig. 2). A large individual was identified from an underwater photograph taken by Kendall Clements in 2010 at “The Archways”, Burgess Island, Mokohinau Group, outer Hauraki Gulf, at a depth of 16–20 m. The latter is the shallowest confirmed record for the species.

**Discussion.** *Parapercis nigrodorsalis* (Figs. 1–2) is most similar to *P. binivirgata* (Figs. 3–4), sharing similar morphology, meristic formulae, and coloration, including numerous dark transverse bars on the upper sides. It differs most obviously in coloration, having seven broad bands across the upper body, the first originating below the posterior portion of the spinous dorsal fin and the second to seventh bifurcated to form close-set double bars with darker smudge-like blotches below (versus 13 narrower, distinctly separate dark bars on the upper body, lacking darker spots or blotches below, and the first bar originating on the nape). In addition, the spinous dorsal-fin membrane is jet black, the pelvic fins lack dark pigmentation, the upper pectoral-fin base lacks a red blotch and there are six alternating orange-yellow and blue-grey bands on the caudal fin in *P. nigrodorsalis* (versus spinous dorsal-fin membrane semitranslucent to faintly reddish, or greyish, pelvic fins dusky on the basal half to two-thirds of medial rays, upper pectoral-fin base with a conspicuous red blotch, and seven alternating bands on the caudal fin, respectively, in *P. binivirgata*). Although meristics for both species strongly overlap, there are modal differences in counts of pectoral-fin rays (19–21, modally 19 in *P. nigrodorsalis*, versus 19–21, modally 20 in *P. binivirgata*), lateral-line scales (57–63, modally 60, versus 59–67, modally 64) and total gill rakers (13–15, modally 14, versus 12–15, modally 13) (Table 2). The two species are sympatric in the region off the eastern side of the North Island of New Zealand, but *P. nigrodorsalis* has not been recorded elsewhere within the known range of *P. binivirgata*.

Among other species of *Parapercis* with numerous transverse bands on the upper body, *P. nigrodorsalis* is readily distinguished from *P. decemfasciata* by the number of bands and the dorsal-fin spine and ray counts (10 narrow pale reddish bars, extending well below midbody, and dorsal fin IV, 25, versus seven broader bands not extending below midbody, and dorsal fin V, 23 in *P. nigrodorsalis*); from *P. multifasciata* by coloration (10 narrow dusky bands extending below midbody and several broad wavy yellow bands across the head and nape, versus seven broader bands not extending below midbody and no yellow bands on head and nape in *P. nigrodorsalis*); and from *P. allporti* by a lower dorsal fin-ray count, absence of palatine teeth and different configuration of dark bars on the upper body (dorsal-fin rays 21, palatine teeth absent, and five to seven principal dark bars alternating with numerous narrower secondary bars, extending below midbody, versus dorsal-fin rays 23, palatine teeth present and seven broad bands not extending below midbody in *P. nigrodorsalis*).

A successful genetic sequence was only generated from a single specimen of the new species (paratype NMNZ P.052476). Unfortunately this specimen was in relatively poor condition and no images of it in fresh coloration were available, hence it was unsuitable for designation as the holotype. NMNZ P.052476 was collected from a location closely adjacent to that of the holotype and has almost identical meristic and morphometric values and preserved coloration to the holotype, leaving no doubt that the two are conspecific.

TABLE 3. Percentage sequence divergence among species of *Parapercis* sampled and outgroup specimens.

<i>Parapercis</i>	<i>P. allporti</i>	<i>P. binivirgata</i>	<i>P. colias</i>	<i>P. gilliesii</i>	<i>P. nigrodorsalis</i> sp. nov.	<i>P. sp. 4</i> (of Johnson)	<i>Pinguipes</i> <i>brasiliensis</i>	<i>Pinguipes</i> <i>chiliensis</i>	<i>Prolatilus</i> <i>jugularis</i>	<i>Pseudopercis</i> <i>semifasciata</i>
<i>P. allporti</i>	0.00%									
<i>P. binivirgata</i>	19.02% ± 0.05%	0.00%								
<i>P. colias</i>	15.47% ± 0.02%	19.75% ± 0.01%	0.00%							
<i>P. gilliesii</i>	3.04% ± 0.03%	18.29% ± 0.01%	15.04% ± 0.01%	0.00%						
<i>P. nigrodorsalis</i> sp. nov.	20.35% ± 0.09%	5.38% ± 0.0%	19.70% ± 0.02%	19.38% ± 0.0%	N/A					
<i>P. sp. 4</i> (of Johnson)	18.72% ± 0.24%	8.06% ± 0.0%	19.79% ± 0.04%	18.73% ± 0.10%	7.63%	N/A				
<i>Pinguipes brasiliensis</i>	18.21% ± 0.01%	16.56% ± 0.02%	19.31% ± 0.02%	18.52% ± 0.01%	17.06% ± 0.0%	16.15% ± 0.0%	0.00%			
<i>Pinguipes chiliensis</i>	19.08% ± 0.06%	17.40% ± 0.02%	18.55% ± 0.02%	18.78% ± 0.04%	17.05% ± 0.0%	16.16% ± 0.0%	3.83% ± 0.0%	0.00%		
<i>Prolatilus jugularis</i>	19.88% ± 0.05%	17.11% ± 0.01%	19.77% ± 0.02%	19.82% ± 0.04%	17.20% ± 0.03%	17.40% ± 0.0%	15.62% ± 0.1%	15.08% ± 0.06%	0.15%	
<i>Pseudopercis semifasciata</i>	19.89% ± 0.04%	18.10% ± 0.02%	18.24% ± 0.02%	19.57% ± 0.03%	17.73% ± 0.0%	17.47% ± 0.0%	6.29% ± 0.0%	3.99% ± 0.0%	13.16% ± 0.1%	0.00%

**TABLE 4.** Specimens used in molecular analyses (\* denotes sample IDs, Universidad de Concepcion, Chile).

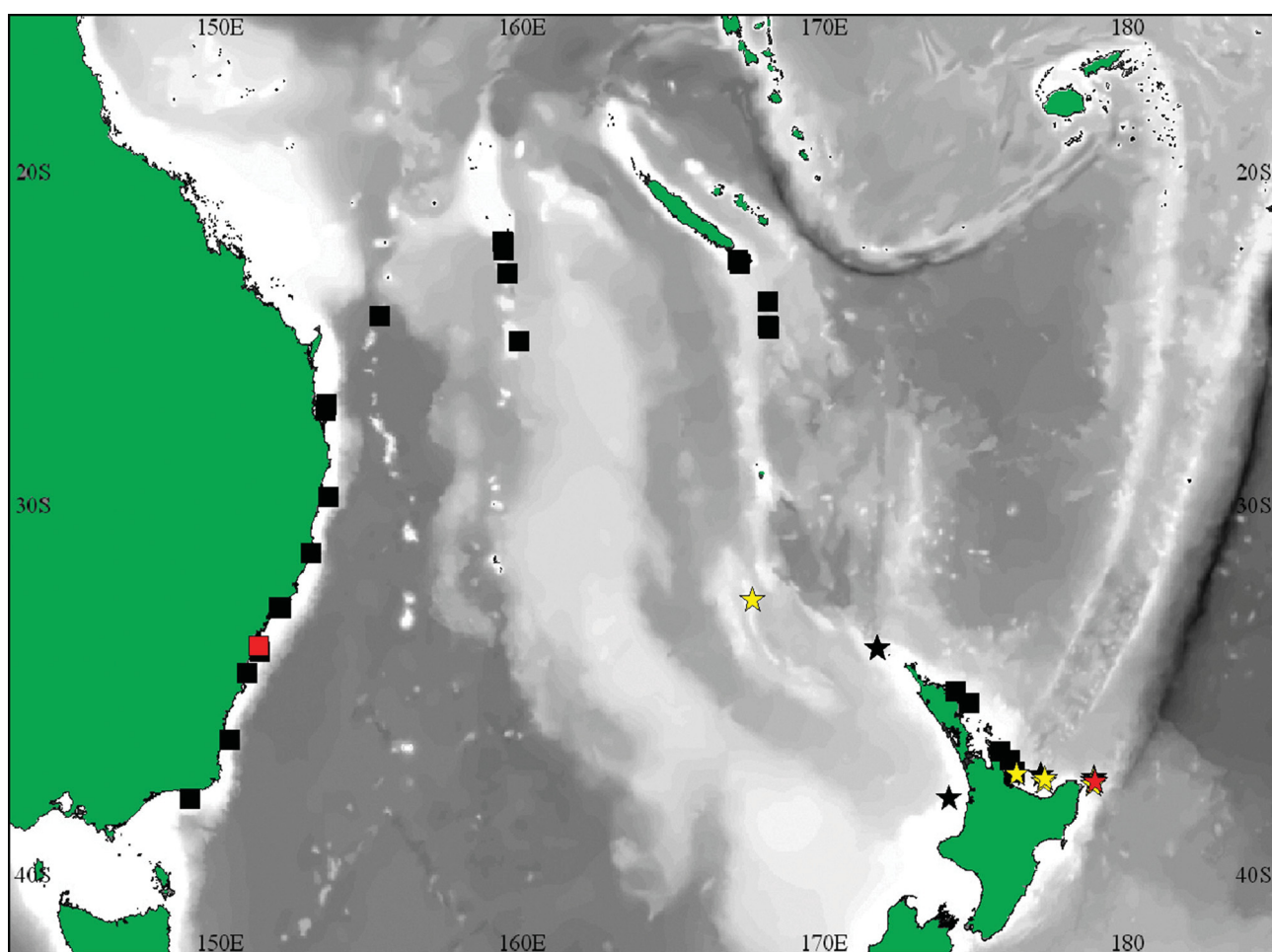
Species	Locality	Latitude	Longitude	Voucher Specimen	GenBank Accession No.	BOLD Sequence ID.
<i>Paraperis allporti</i> 1	East of Newcastle, Australia	32° 54' S	151° 59' E	CSIRO H.7482-01	KJ817171	N/A
<i>Paraperis allporti</i> 2	off Bermagui, Australia	36° 16' S	150° 22' E	AMS I.40809-002	KJ817172	N/A
<i>Paraperis binivirgata</i> 1	East of Newcastle Bight, Australia	32° 53' S	152° 00' E	CSIRO H.7480-01 (smallest specimen)	KJ817173	N/A
<i>Paraperis binivirgata</i> 2	East of Newcastle Bight, Australia	32° 53' S	152° 00' E	CSIRO H.7480-01 (largest specimen)	KJ817174	N/A
<i>Paraperis binivirgata</i> 3	East of Newcastle, Australia	32° 54' S	151° 59' E	QM I.39134 (largest specimen)	KJ817175	N/A
<i>Paraperis binivirgata</i> 4	East of Newcastle, Australia	32° 54' S	151° 59' E	CSIRO H.7482-02 (largest specimen)	KJ817176	N/A
<i>Paraperis coltas</i> 1	Chatham Island, New Zealand	44° S	176° W	CSIRO H.5553-02	KJ637693	FOAC276-05
<i>Paraperis coltas</i> 2	Chatham Island, New Zealand	44° S	176° W	not vouchered	KJ637692	FOAC277-05
<i>Paraperis coltas</i> 3	Chatham Island, New Zealand	44° S	176° W	CSIRO H.5553-01	EF609428	FOAC275-05
<i>Paraperis gilliesii</i> 1	Reserve Bank, Chatham Rise, New Zealand	43° 30.69' S	176° 51.9' E	NMNZ P.044358	KJ817178	N/A
<i>Paraperis gilliesii</i> 2	South slope, Pegasus Canyon, outer Canterbury Bight, New Zealand	43° 31.18' S	173° 33.07' E	NMNZ P.045155	KJ817179	N/A
<i>Paraperis gilliesii</i> 3	South slope, Pegasus Canyon, outer Canterbury Bight, New Zealand	43° 31.2' S	173° 33.07' E	NMNZ P.045156	KJ817180	N/A
<i>Paraperis nigrodorsalis</i> sp. nov.	Ranfurly Bank, New Zealand	37° 38.78' S	178° 56.79' E	NMNZ P.052476	KJ817177	N/A
<i>Paraperis</i> sp. 4 (of Johnson)	NW of Cape Leveque, Australia	15° 00.62' S	121° 39.75' E	CSIRO H.6570-35	N/A	N/A
<i>Pinguipes brasiliensis</i> 1	Patagonia, Argentina	44° 04' S	64° 21' W	INIDEP-T 0086	EU074542	FARG086-06
<i>Pinguipes brasiliensis</i> 2	Argentina	39° 22' S	59° 28' W	INIDEP-T 0464	N/A	FARG465-08
<i>Pinguipes chilensis</i> 1	Golfo Arauco, Chile	36° 28' S	73° 21' W	0359/C02*	N/A	FCHIL395-07
<i>Pinguipes chilensis</i> 2	Golfo Arauco, Chile	36° 28' S	73° 21' W	0359/C03*	N/A	FCHIL396-07
<i>Prolatilus jugularis</i> 1	Biobio, Chile	36° 42' S	73° 04' W	0356/D10*	N/A	FCHIL043-06
<i>Prolatilus jugularis</i> 2	Biobio, Chile	36° 42' S	73° 04' W	0356/D11*	N/A	FCHIL044-06
<i>Pseudoperis semifasciata</i> 1	Argentina	39° 46' S	60° 04' W	INIDEP-T 0482	N/A	FARG483-08
<i>Pseudoperis semifasciata</i> 2	Patagonia, Argentina	44° 02' S	64° 27' W	INIDEP-T 0079	EU074571	FARG079-06



**FIGURE 4.** *Parapercis binivirgata* from New Zealand, North Tasman Basin and Norfolk Ridge. A. NMNZ P.045603, male, 142.4 mm SL, Bird Rock, Bay of Islands, New Zealand; B. QM I.35758, male, 157 mm SL, Fraser Seamount; C. Female, ca. 90 mm SL, Kaiyo Maru Seamount, Norfolk Ridge, New Caledonia (uncatalogued) (Photo: C. Roberts).

**Comments on type status, variation and distribution of *P. binivirgata*.**

Eschmeyer (2014) lists two syntypes for *P. binivirgata*, AMS I.3402 from New South Wales and AMS I.5256 from Coogee. However, in the original description Waite (1904) states “The foregoing description, and the accompanying figure are based on the larger of two examples taken on the coast of New South Wales, one in May, 1895, the other, which measures 180 mm in length, obtained at Coogee by Mr. H. Newcombe in April, 1902”. The second of those two specimens was found to be 175.2 mm TL and 147.1 mm SL, while the former was only 162 mm TL and 138 mm SL. Both specimens are now over a century old and their length is likely to have contracted marginally in preservative, accounting for a slightly lesser figure than that originally taken. Waite’s count of 21 pectoral-fin rays provides further evidence of the correct type status of the two specimens. AMS I.5256 has a count of 21/21 rays, while AMS I.3402 has 20/20. A count of 21 pectoral-fin rays is unusual for the species, with asymmetrical counts of 21/20 rays recorded in two of 51 specimens examined, while other than for AMS I.5256, no other counts of 21/21 were found (see Table 2). As AMS I.5256 is clearly the larger of the two specimens and has collection data, a TL measurement and a pectoral-fin ray count consistent with that mentioned by Waite, it is confirmed as the unique holotype. AMS I.3402 is merely a mentioned specimen and has no type status.



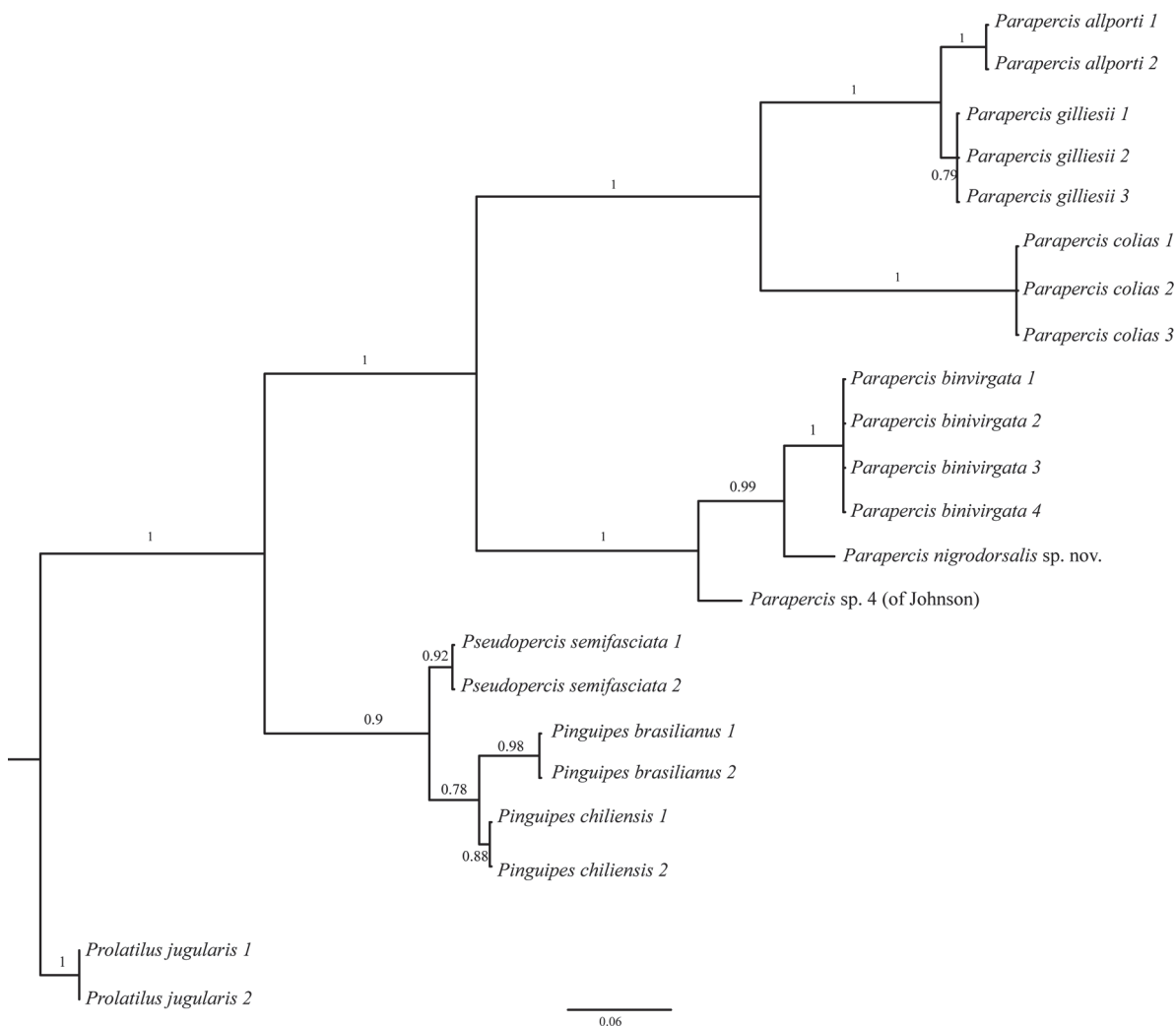
**FIGURE 5.** Distribution of *Parapercis nigrodorsalis* sp. nov. and *P. binivirgata* in the South-West Pacific Ocean, based on material examined (*P. nigrodorsalis* = stars, *P. binivirgata* = squares, holotypes in red, paratypes in yellow, non-types in black).

Some revisions to Waite's meristic data were also recorded. His counts of I, 20 for anal-fin rays, 5 + 20 for scales in transverse series and 68 for lateral-line scales, have been revised to I, 19, 5 + 16 and 65 respectively. The higher lateral-line scale count quoted by Waite is most likely explained by his inclusion of several pored scales on the base of the caudal fin.

In his revision of *Parapercis*, Cantwell (1964) tabulated meristic data for three specimens of *P. binivirgata*. Most values were consistent with those obtained here; however, Cantwell's counts of caudal vertebrae are one lower due to his exclusion of the urostylar complex. In addition, his counts for longitudinal scale rows are slightly higher than for pored lateral-line scales, as the scale row above the lateral line has one or two scales on the body preceding the origin of the lateral line.

*Parapercis binivirgata* is known from south-eastern Australia, between Moreton Island, Queensland (27°03'S 153°31'E) and Gippsland, eastern Victoria (approximately 38°S 149°E), Fraser Seamount in the north Tasman Basin (24°25'S 155°17'E), the north end of the Norfolk Ridge, south of New Caledonia, the north end of the Lord Howe Rise, between South Bellona Plateau and Capel Tablemount, and the eastern side of the North Island of New Zealand, between the Bay of Islands and the Bay of Plenty (Moreland, 1975; Rivaton, 1989; Kulbicki *et al.*, 1994; Richer de Forges *et al.*, 2004; Hoese *et al.* 2006; this study) (Fig. 5). The first record of *P. binivirgata* from New Zealand waters was reported by Moreland (1975), based on two specimens from Mayor Island in the Bay of Plenty. Of these two, the specimen figured, NMNZ P.003383, 156.4 mm, is *P. binivirgata*; however, NMNZ P.002207, 156.0 mm, is confirmed here as a specimen of *P. nigrodorsalis* sp. nov. Given that Moreland only had access to these two specimens, it is perhaps unsurprising that he interpreted the relatively subtle differences in coloration between the specimens as intraspecific variation. Populations of *P. binivirgata* from Australian continental shelf waters versus those from waters of the North Tasman Basin, Lord Howe Rise, Norfolk Ridge and New Zealand,

differ slightly in modal counts of lateral-line scales (60–67, modally 65, versus 59–66, modally 63, respectively) (Table 2). The latter also appear to reach a greater maximum size (184.2 versus 147.1 mm SL), inhabit greater maximum depths (430 m versus 165 m), and have a slightly greater orbital diameter than Australian specimens (8.1–10.3 versus 7.7–9.2 % SL) (Table 1). However, no other significant differences were recorded in counts or proportional measurements, and no variation was noted in the configuration of dark bars and blotches, or other aspects of the coloration (Figs. 3–4). In the absence of more conclusive evidence, including fresh specimens to provide tissue samples for DNA analysis, populations from Australian continental shelf waters are regarded as conspecific with those from other south-western Pacific waters, pending a more thorough examination using DNA barcoding, or other genetic techniques.



**FIGURE 6.** Majority-rule consensus tree of species of *Parapercis* and outgroup taxa based on four independent runs of the DNA Barcoding CO1 fragment. Posterior probabilities are detailed above the branches. Branches with <60% support were collapsed. Scale bar represents 6% uncorrected sequence divergence. Details of specimen data and GenBank/BOLD accession numbers are provided in Table 4.

**Comparative materials.** *Parapercis binivirgata* (66: 63.1–184.2 mm) **Australia:** AMS I.5256, 147.1 mm, holotype, Coogee, NSW, 33°55'S 151°17'E, H. Newcombe, Apr 1902; AMS I.3402, 138.0 mm, coast of New South Wales, May 1895; AMS E.5716, 41.0 mm, off Gippsland, Vic, ca 38°S 149°E, 146 m, trawl, FIS *Endeavour*, 17 Oct 1914 (counts and measurements not recorded); AMS I.19716-001, 106.6 mm, 5 km off Kiama, NSW, 34°40'S 150°53'E, hook & line, P. Dobson, Apr 1977; AMS I.23485-002, 2: 109.7–143.3 mm, off Bate Bay, NSW, 34°05'S 151°18'E, 132–134 m, trawl, K. Graham, 22 Nov 1982; AMS I.31333-002, 4: 80.1–111.6 mm, off Newcastle, NSW, 32°51'S 151°56'E to 32°55'S 152°01'E, 64–75 m, trawl, K. Graham, 10 Apr 1990; AMS I.31441-003, 2: 118.4–122.6 mm, off Newcastle, NSW, 32°52'S 151°56'E to 32°56'S 152°01'E, 64–77 m, trawl,

K. Graham, 11 Dec 1990; AMS I.32121-003, 3: 82.7–113.5 mm, off Newcastle, NSW, 32°53'S 152°01'E to 32°54'S 151°59'E, 73–79 m, trawl, K. Graham, 7 Jun 1990; AMS I.40290-001, 3: 120.2–124.9 mm, off Bermagui, 36°27'S 150°18'E to 36°22'S 150°19'E, 156–165 m, trawl, K. Graham, 2 May 2000; AMS I.40449-003, 3: 87.5–125.6 mm, SE of Yamba, NSW, 29°45'S 153°36'E, 80–85 m, trawl, K. Graham, 9 Jul 1999; MNHN 1981-0056, 151.0 mm, off Shark Spit, Moreton Island, Qld, 27°15'S 153°30'E, trawl, J. Thomson, 19 Dec 1978; QM I.26219, 2: 110.0–124.3 mm, between Crescent Head and Port Macquarie, NSW, ca 31°20'S 153°00'E, trawl, NSW Fisheries, 7 Feb 1958; QM I.33179, 108.9 mm, SE of Cape Moreton, Qld, 27°03'S 153°31'E, trawl 86 m, Qld Fisheries Service, 14 Mar 2001; QM I.33191, 111.4 mm, SE of Cape Moreton, Qld, 27°04'S 153°32'E, trawl 86 m, Qld Fisheries Service, 12 Mar 2001; QM I.37221, 146 mm, SE of Cape Moreton, Qld, 27°03'S 153°31'E, trawl 86 m, Qld Fisheries Service, 14 Mar 2001(skeleton); QM I.39133, 107.3 mm, E of Newcastle Bight, NSW, 32°52'S 152°02'E to 32°53'S 152°00'E, 68–69 m, trawl, K. Graham, 28 Feb 1996; QM I.39134, 4: 63.1–116.6 mm, E of Newcastle, NSW, 32°55'S 151°58'E to 32°54'S 151°59'E, 73–75 m, trawl, K. Graham, 6 Mar 1996 (genetic sample CSIRO GT.7148 from 116.6 mm specimen).

**North Tasman Basin:** QM I.35758, 157 mm, Fraser Seamount, Qld, 24°25'S 155°17'E, 387 m, trawl, Australian Fisheries Management Authority, 15 Feb 2004.

**Lord Howe Rise:** MNHN 2000-1389, 152.4 mm, Capel Tablemount, Lord Howe Rise, 25°10'01"S 159°52'59"E, 280–290 m, trawl, Campagne Musorstom 5, 7 Oct 1986; MNHN 2000-1392, 2: 149.9–153.5 mm, Argo Bank, Lord Howe Rise, 23°09'S 159°31'01"E, 280 m, trawl, Campagne Musorstom 5, 11 Oct 1986; MNHN 2000-1401, 176.1 mm, S of Bellona Plateau, New Caledonia, 22°10'19"S 159°22'08"E, 340 m, trawl, Campagne Musorstom 5, 12 Oct 1986; MNHN 2000-1402, 2: 110.1–121.8 mm, S of Bellona Plateau, New Caledonia, 22°10'59"S 159°24'E, 350–345 m, trawl, Campagne Musorstom 5, 12 Oct 1986; MNHN 2000-1405, 150.0 mm, Nova Bank, S of Bellona Plateau, New Caledonia, 22°25'01"S 159°24'E, 330 m, trawl, Campagne Musorstom 5, 13 Oct 1986.

**Norfolk Ridge:** MNHN 2000-1390, 156.2 mm, SW of Isle of Pines, New Caledonia, 22°43'59"S 167°07'59"E, 345 m, trawl, M. Kulbicki, 24 Jan 1985; MNHN 2000-1395, 184.2 mm, SW of Isle of Pines, New Caledonia, 22°51'S 167°12'E, 405–430 m, trawl, Campagne Musorstom 4, 28 Sept 1985; MNHN 2000-1404, 114.0 mm, Norfolk Ridge, south of New Caledonia, 24°44.6'S 168°09.3'E, 230–300 m, trawl, Campagne Chalcal 2, 27 Oct 1986; MNHN 2000-1406, 110.1 mm, Norfolk Ridge, south of New Caledonia, 24°47'S 168°09'E, trawl, Campagne Chalcal 2, Oct 1986; NMNZ P.029011, 68.7 mm, Kaiyo Maru Seamount, Norfolk Ridge, New Caledonia, 24°48.15'S 168°09.1'E, 250–270 m, trawl, 16 Oct 1992; NMNZ P.029037, 2: 87.4–92.9 mm, Kaiyo Maru Seamount, Norfolk Ridge, New Caledonia, 24°43.75'S 168°07.575'E, 270–290 m, trawl, 17 Oct 1992; NMNZ P.029087, 4: 76.3–88.5 mm, Kaiyo Maru Seamount, Norfolk Ridge, New Caledonia, 24°43.8'S 168°07.525'E, 260–280 m, trawl, 17 Oct 1992.

**New Zealand:** NMNZ P.003383, 156.4 mm, off Mayor Island, Bay of Plenty, New Zealand, 37°21'S 176°15'E, Mar 1963; NMNZ P.007362, 124.4 mm, Off Mayor Island, Bay of Plenty, New Zealand, 37°19'S 176°15'E, Sept 1977; NMNZ P.019478, 165.8 mm, E side of Poor Knights Islands, New Zealand, 35°30'S 174°44'E, 146 m, longline, Aug 1985; NMNZ P.045270, 2: 145.3–150.6 mm, off Mercury Bay, Whitianga, Coromandel, New Zealand, 36°47'S 175°46'E, 70–90 m, handline, 2005; NMNZ P.045603, 142.4 mm, Bird Rock, Bay of Islands, New Zealand, 35°10'S 174°19'E, 20 m, longline, 3 Apr 2009; NMNZ P.045606, 145.3 mm, 1.5 km S of Alderman Islands, New Zealand, 37°00'S 176°05.5'E, 85 m, handline, June 2009.

*Paraperis decemfasciata* (2: 81.1–127.5 mm) QM I.37580, 81.1 mm, Donggang, Pingtung, Taiwan, H. Ho, 16 Aug 2005; QM I.37581, 127.5 mm, same data as previous.

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